SHORT COMMUNICATIONS

J. Raptor Res. 32(2):175–177

BREEDING BIOLOGY AND NESTLING DIET OF THE GREAT BLACK-HAWK

NATHANIEL E. SEAVY
17142 Lemolo Shr. Dr. N.E., Poulsbo, WA 98370 U.S.A.

RICHARD P. GERHARDT
341 N.E. Chestnut St., Madras, OR 97741 U.S.A.

KEY WORDS: *Great Black-Hawk*; Buteogallus urubitinga; *breeding biology*; *diet*; *Petén*; *Guatemala.*

The Great Black-Hawk (*Buteogallus urubitinga*) ranges from Mexico south to eastern Bolivia, Paraguay and northern Argentina, inhabiting coastal lowlands and foothills (Brown and Amadon 1968). The few accounts describing its breeding biology have been brief and at times contradictory (Grossman and Hamlet 1964, Smithe 1966, Brown and Amadon 1968, ffrench 1976, Mader 1981). Based primarily on isolated observations of hunting and prey remains collected beneath roosts, a wide variety of prey items has been recorded, including invertebrates, fish, frogs, reptiles, birds, mammals and carrion (Dickey and van Rossem 1938, Lowery and Dalquest 1951, Haverschmidt 1962, Wetmore 1965, Mader 1981, Olmos 1990, Lewis and Timm 1991).

We studied Great Black-Hawks in Tikal National Park, Petén, Guatemala as part of The Peregrine Fund's "Maya Project." Two nests were located and studied during 1991, and information collected on food habits was published by Gerhardt et al. (1993). We continued to study the species during 1993–94. Here, we present information on its breeding biology, including nesting phenology, reproductive success and nest descriptions, and additional dietary data.

STUDY AREA AND METHODS

Tikal National Park covers 576 km^2 in N.E. Guatemala (17°13′N, 89°38′W). Elevation averages 200–250 m, topography is gently rolling, and the climate is tropical, with annual rainfall of about 135 cm. The rainy season begins in June or July, with the highest rainfall in September, and a pronounced dry season occurs from February until June or July. Vegetation, climate and land use patterns of the Tikal area were described by Schulze (1992).

Observations of courtship behavior or of hawks carrying nest material or prey led to the eventual location of nests. After they were found, nests were checked every 2–3 d to record nesting phenology. During all years we recorded nest size (diameter and depth) and situation, and described nest trees. Observations of prey deliveries to nests were made with binoculars from observation platforms constructed in trees about 35 m from nests. We climbed to nests weekly to weigh and measure nestlings in 1991; in 1993 and 1994 we avoided climbing to nests, except to verify some clutch sizes, until after fledging. Additional information on clutch size, nesting phenology and nests was obtained from egg-set data records from published accounts, the Western Foundation of Vertebrate Zoology (WFVZ), and the Delaware Museum of Natural History (DMNH).

RESULTS AND DISCUSSION

The earliest we observed nesting activity of Great Black-Hawks was 23 March 1994 when a pair began to copulate and build a nest. Egg-laying dates were known for two nests, 16–17 April 1991 and 4 May 1994. An incubation period of 40 ± 2 d was recorded for one nest Based on this interval, we estimated an additional laying date as 25 March 1994. Known hatch dates were 27 May 1991 and 4 May 1994. One nestling fledged from the nest on 28 June 1994, 55 d after hatching. Another nestling had not yet fledged at the age of 63 d when observations were concluded on 27 July 1991. One nest, found on 6 July 1994, contained a nestling estimated to be 60 d old that had not yet fledged. We know of no other accounts of the duration of incubation or nestling periods for Great Black-Hawks in the wild. For the Common Black-Hawk (*Buteogallus anthracinus*), slightly shorter incubation (37–39 d) and nestling (43–52 d) periods have been reported (Schnell 1994). Substantial geographic variation in Great Black-Hawk breeding phenology may exist. At Tikal young fledged at the onset of the rainy season.

In Surinam (Haverschmidt 1962), Trinidad (ffrench 1976), and Venezuela (Mader 1981), however, the species has been observed incubating during, or at the onset of, the rainy season. Egg-laying may occur as early as December in El Salvador (Brown and Amadon 1968) and as late as June in Tamaulipas, Mexico (Martin et al. 1954). Eggs in DMNH and WFVZ were collected in Trinidad and Venezuela during April and May and in Argentina from August–January.

Our observations of one juvenile each from two 1994 nests indicated an extended dependency period during which food was provided by the adults. We observed a prey delivery to one juvenile almost 8 mo after fledging, and another juvenile was consistently found within 500 m of the nest tree up to an age of 12 mo, when observations were discontinued. Such an extended dependency period is supported by Mader (1981) who reported an immature Great Black-Hawk, ca. 7 mo postfledging, perched next to an adult, begging for food. In contrast, the Common Black-Hawk is believed to reach independence about 2 mo after fledging (Schnell 1994). Postfledging dependency periods of from 7 mos to more than a year have been documented for several other neotropical raptors, including Ornate Hawk-Eagles (*Spizaetus ornatus*; Madrid et al. 1992), Black Hawk-Eagles (*S. Tyrannus*; D, Whitacre and J. Lopez pers. comm.), Harpy Eagles (*Harpia harpyja*; E. Alvarez pers. comm.), Crested Eagles (*Morphnus guianensis*; D. Whitacre pers. comm.), and Gray-backed Hawks (*Leucopternis occidentalis*; Vargas 1995).

All nests we located were in "bajo" and "transitional" forest types, which are at the lower end of the topographic gradient. Seasonally flooded, these forest types are characterized by dense understory vegetation and a canopy height that is generally low, but broken by large, isolated, emergent trees (Schulze 1992). Nests were built within live, emergent trees (*Swietenia macrophylla, Bucida buceras, Platymiscium* spp., *Ceiba pentandra* and *Lonchocarpus castilloi*), which had minimal crown contact with the surrounding forest canopy. Nest trees (N = 7) had a mean height of 29 m (SD = 4 m, range = 22–35 m) and a mean DBH of 120 cm (SD = 81 cm, range = 66–300 cm). Nests were at a mean height of 25 m (SD = 5 m, N = 7, range = 20–31 m) and supported by branches and/or vine tangles.

Nests were constructed of dry sticks and lined with green, leafy twigs. Throughout incubation and nestling periods, adults added fresh, leafy twigs to nests. Nests were flat throughout the nesting period, with only one having a measurable depression, 10 cm in depth. Smithe (1966), Brown and Amadon (1968), and egg records from Venezuela and Trinidad (DMNH and WFVZ) described nests as "deeply-cupped," but our observations of flat nests concur with the description by Grossman and Hamlet (1964). Considering only nests that contained clutches, the mean nest diameter was 83 cm (SD = 21 cm, N = 4, range = 53–100 cm), and mean external height was 56 cm (SD = 12 cm, N = 3, range = 42–65 cm).

We found eight nests that Great Black-Hawks were constructing or embellishing. Four did not contain eggs and have been excluded from analysis because we were unable to determine whether these pairs nested at alternate sites. Of the four nests in which eggs were laid, two failed during incubation, after 10 and 37 d, respectively. Young hatched at two nests; one was killed by an unknown predator 6.5 wk after hatching and the other fledged.

In each of three nests at which we documented clutch size, only one egg was laid. Three additional nests, discovered after hatching, contained a single nestling each. We documented 27 Great Black-Hawk egg sets from Venezuela (7 sets), Argentina (18 sets) and Trinidad (2 sets) (Swann 1923, Norris 1926, WFVZ, DMNH). All clutches contained a single egg. To our knowledge the only evidence of a larger clutch size is an observation of a "family group" of four individuals in Mexico (Martin et al. 1954).

Including the 106 prey of Gerhardt et al. (1993), studies of Great Black-Hawks in Tikal have identified 126 prey items at least to class. Prey delivered to nestlings have included 41 lizards (32.5% of identified prey), 34 snakes (27.0%), 24 mammals (19.1%), 16 birds (12.7%), eight anurans (6.4%) and three insects (2.4%). Basilisk lizards (*Basiliscus vittatus*) have made up a large percentage (70.7%) of all lizards delivered. Other lizards in the diet include arboreal genera, including *Norops* (formerly *Anolis*). Snakes include both arboreal and terrestrial as well as venomous and nonvenomous species. *Boa* and *Oxybelis* have been the snake genera most commonly observed in the diet. Mammals delivered to the nest have included eight bats (6.4% of identified prey), nine rodents (7.1%) and two marsupials (1.6%). Bats are medium-sized species, about 30 g in mass. Although we were unable to identify bats beyond order during nest observations, *Artibeus* spp. remains were collected on several occasions from nests. Rodents have included squirrels (*Sciurus* spp.) and unidentified cricetids. The two small marsupials were probably mouse-opossums (*Marmosa mexicanus*). Birds in the diet have ranged in size from an oriole (*Icterus* spp.) to a Pale-billed Woodpecker (*Campephilus guatemalensis*). Birds most commonly observed as prey items are medium-sized *Columba* spp. and Clay-colored Robins (*Turdus grayi*). Anurans and insects were infrequently delivered to nests.

The variety of prey delivered to the nests and the wide range of prey items and foraging habits reported in the literature indicate that Great Black-Hawks are dietary generalists and opportunists, able to exploit a large diversity of prey types and hunting situations. Midday deliveries of nocturnal mammalian prey and reports of predation upon nestlings (Lewis and Timm 1991) and eggs (Brown and Amadon 1968, Olmos 1990) suggest that Great Black-Hawks may invest time in searching for vulnerable and easily captured prey. Insects and anurans

may be captured more frequently than our observations suggest; adults may eat most such small prey upon capture rather than transporting them to nests. Although fish and crustaceans are often mentioned as important prey items (Grossman and Hamlet 1964, Brown and Amadon 1968), we observed no indication that Great Black-Hawks at Tikal utilized such aquatic prey.

Great Black-Hawks exhibit a conservative breeding biology that is characteristic of many large raptors, especially in the tropics (Newton 1979); clutch size is small and young appear to have a protracted dependency period. Additionally, the fact that the species requires several years to obtain full adult plumage (Howell and Webb 1995, R. Gerhardt unpubl. data) suggests that there is a substantial population of nonbreeding subadults.

RESUMEN.—Estudiamos la biología reproductiva de *Buteogallus urubitinga* en el parque Nacional Tikal, Petén, Guatemala, durante 1991, 1993 y 1994. Un sólo período de incubación fué de 40 (±2 días); el pichón emplumó a la edad de 55 días. Los nidos son construidos con ramas y palos grandes en árboles emergentes. El tamaño de la nidada de 3 nidos en Tikal, 2 en Trinidad, 7 en Venezuela y 18 en Argentina fue de un huevo por nido. De las 126 presas identificadas en tres nidos la mayoría fueron reptiles (59.5%), mamíferos (19.1%) y aves (12.7%).
[Traducción de César Márquez]

ACKNOWLEDGMENTS

This is a contribution of the "Maya Project," a conservation research effort of The Peregrine Fund. Financial support was provided by Robert Berry, Crystal Channel Foundation, Fanwood Foundation, Gold Family Foundation, KENNETECH/U.S. Windpower, the John D. and Catherine T. MacArthur Foundation, Norcross Foundation, Hank and Wendy Paulson, Pew Charitable Trusts, Andrés Sada, Joe and Flinda Terteling, and the U.S. Agency for International Development. We are grateful to the curatorial staff at the Delaware Museum of Natural History and the Western Foundation of Vertebrate Zoology for providing data on egg clutches. Lloyd Kiff, Carl Marti, Dave Whitacre, Rich Glinski, and an anonymous reviewer provided helpful comments on the manuscript.

LITERATURE CITED

BROWN, L. AND D. AMADON. 1968. Eagles, hawks, and falcons of the world. McGraw-Hill Book Co., New York, NY U.S.A.

DICKEY, D.R. AND A.J. VAN ROSSEM. 1938. The birds of El Salvador. Zool. Ser., Vol. 23. Field Mus. Nat. Hist., Publ. No. 406. Chicago, IL U.S.A.

FFRENCH. 1976. A guide to the birds of Trinidad and Tobago. Harrowood, Valley Forge, PA U.S.A.

GERHARDT, R.P., P.M. HARRIS AND M.A. VÁSQUEZ M. 1993. Food habits of nesting Great Black-Hawks in Tikal National Park, Guatemala. *Biotropica* 25:349–352.

GROSSMAN, M.L. AND J. HAMLET. 1964. Birds of prey of the world. Crown Publishers, New York, NY U.S.A.

HAVERSCHMIDT, F. 1962. Notes on the feeding habits and food of some hawks in Surinam. *Condor* 64:154–158

HOWELL, S.N.G. AND S. WEBB. 1995. A guide to the birds of Mexico and northern Central America. Oxford Univ. Press, New York, NY U.S.A.

LEWIS, S.E. AND R.M. TIMM. 1991. Predation on nestling Bare-throated Tiger-Herons by a Great Black-Hawk *Ornitologia Neotropical* 2:37.

LOWERY, G.H., JR. AND W.W. DALQUEST. 1951. Birds from the State of Veracruz, Mexico. Univ. of Kansas Publ , Mus. Nat. Hist., Lawrence, KS U.S.A.

MADER, W.J. 1981. Notes on nesting raptors of the llanos of Venezuela. *Condor* 83:48–51.

MADRID M., H.D., R.A. MADRID M., J.R. CRUZ E., J.L. CÓRDOVA A., M.C. RIVERA, W.E. MARTÍNEZ A. AND A.R CAÁL. 1992. Behavior and breeding biology of the Ornate Hawk-Eagle. Pages 179–191 *in* D.F. Whitacre and R.K. Thorstrom [EDS.], Maya project progress report V. The Peregrine Fund, Boise, ID U.S.A.

MARTIN, P.S., C.R. ROBBINS AND W.B. HEED. 1954. Birds and biogeography of the Sierra de Tamaulipas, an isolated pine-oak habitat. *Wilson Bull.* 66:38–57.

NEWTON, I. 1979. Population ecology of raptors. Buteo Books, Vermillion, SD U.S.A.

NORRIS, J.P., JR. 1926. A catalogue of sets of Accipitres' eggs in the collection of Joseph Parker Norris, Jr, Philadelphia, PA U.S.A. *Oologists' Rec.* 6:25–41.

OLMOS, F. 1990. Nest predation of Plumbeous Ibis by capuchin monkeys and Greater Black-Hawk. *Wilson Bull.* 102:169–170.

SCHNELL, J.H. 1994. Comnion Black-Hawk *Buteogallus anthracinus. In* A. Poole and F. Gill [EDS.], The birds of North America, No. 122, Acad. Nat. Sci., Philadelphia, PA and Am. Ornithologists' Union, Washington, DC U.S.A.

SCHULZE, M. 1992. A preliminary description of woody plant communities of Tikal National Park. Pages 53–62 *in* D.F. Whitacre and R.K. Thorstrom [EDS.], Maya project progress report V. The Peregrine Fund, Boise, ID U.S.A.

SMITHE, F.B. 1966. The birds of Tikal. The Natural History Press, Garden City, NY U.S.A.

SWANN, H.K. 1923. Notes on the Gordon collection of eggs of the Accipiters. *Oologists' Rec.* 3:25–30.

VARGAS, H. 1995. Food habits, breeding biology, and status of the Gray-backed Hawk (*Leucopternis occidentalis*) in western Ecuador. M.S. thesis, Boise State Univ., Boise, ID U.S.A.

WETMORE, A. 1965. The birds of the Republic of Panama, Part 1. Smiths. Misc. Coll., Vol. 150. Washington, DC U.S.A.

Received 17 May 1997; accepted 8 February 1998